



GIS ANALYSIS OF PROPOSED PENNICHUCK BROOK DRINKING WATER PROTECTION BUFFERS

Introduction

At the request of the NH Department of Environmental Services (NH DES), the Nashua Regional Planning Commission (NRPC) performed a GIS analysis of the proposed buffer rules pertaining to the Pennichuck Brook watershed. These rules, intended to secure the drinking water supply for the Nashua region, provide riparian buffers around the supply ponds, tributaries, connected wetlands and intermittent streams (see Table 1). There are two levels of protection in the proposed buffer rules: a no-build zone and a limited cut zone. The GIS analysis involved creating the buffers and applying them to a land use map of the watershed, whereby the actual area affected by the proposed buffer could be determined. The analysis revealed that, out of 17,693 acres in the watershed, 1,934 acres lay within the buffer zone. Of 7,368 acres of vacant or agricultural land, 842 acres would be impacted.

Methodology

The watershed analysis involved three steps. First, a GIS datalayer depicting the proposed rules was developed. Next, the land use data for the watershed was simplified to permit efficient querying. Finally, the two databases were merged to indicate the area of intersection between the proposed rules and existing uses. All GIS activity was performed using software developed by ESRI.

Step 1. Riparian buffers were developed around hydric features according to the proposed buffer rules defined in Table 1. Five unique shapefiles were created representing the rule possibilities. Each of these was assigned a unique value describing the level of protection they represented (below).

Hydric: indicates water features being protected, i.e. wetlands or ponds

Intermittent: indicates the areas of land surrounding intermittent streams

Protected 100-foot: indicates the areas of land in the 'protected area' around adjacent wetlands

Protected 200-foot: indicates the areas of land in the 'protected area'

Protected 400-foot: indicates the areas of land in the 'protected area' between 200 and 400 feet of the protected feature

Restricted: indicates the areas of land in the 'restricted area' within 100 feet of the protected feature

Upland: indicates islands of dry land surrounded by protected hydric features

The five shapefiles were then converted to coverages and unioned together. The resulting datafile contained a significant amount of overlap between different protection levels of the proposed buffer rules. In the instances where buffers overlapped, the most stringent level of protection was determined to apply.

Step 2. The simplified land uses developed in the *Pennichuck Brook Watershed Build-out Analysis* (NRPC, 2003) were used in this step. During that project, every parcel in the watershed was assigned one of the following land use codes: agricultural, conservation, developed (including roads), hydric and vacant. Land uses were primarily derived from local assessor's codes, and reviewed against aerial photography or in the field where necessary.

Step 3. The final step involved merging the proposed buffer rules datalayer with the simplified land use information. The resulting database indicates the area of intersection between the proposed buffers and various land use types and can be used to determine the affected areas. This information was mapped and summarized in Table 2 and on the attached map.



Table 1: Applicability of Proposed Pennichuck Brook Watershed Rules

	From Pennichuck Pond to Supply Pond Dam	Tributaries (except intermittent streams)	Adjacent Wetlands
On the water	No swimming or gas motors; no boats below Holt Pond Dam		“Protected Area”
Within 100 feet	“Restricted Area” No disturbance except passive recreation facilities permitted by DES; no wastewater discharge; no decayable waste		
100 to 200 feet	“Protected Area” Shoreland Protection standards; no hazardous or solid waste; no regulated substances; no fertilizer*	“Protected Area”	(same as remainder of watershed)
200 to 400 feet		(same as remainder of watershed)	
Remainder of watershed	Projects requiring local subdivision or site plan approval with > 15% impervious cover must notify PWW and other towns, comply with stormwater treatment and infiltration standards, and have O & M plan. Timber harvesting requires town review and approval.		

Source: NH DES, 2003

Results and Conclusions

Table 2 summarizes the land uses in the watershed affected by the proposed buffer rules. A total of 1,929 acres of land are affected by the proposed buffer rules, 759 acres, or 39.3%, are currently undeveloped. Of the undeveloped area, the greatest amount is within the Town of Merrimack, with 241 acres or 31.7%, followed by the Town of Hollis, with 212 acres or 27.9%. Much of the vacant area in Merrimack surrounds the Fidelity Investments property in the vicinity of Continental Boulevard. When agricultural land is considered, the Hollis share of affected area increases to 295 acres or 38.8%, while Merrimack, with no agricultural uses in the watershed, remains the same.

One observation that should be noted relates to the 100-foot restrictive buffer (solid red on the attached map) around the ponds and tributaries. In many instances, this buffer is superseded by the wetlands, whose boundary extends beyond 100 feet of the ponds and tributaries. For example, the map indicates that the western shores of Pennichuck Pond and the adjacent wetlands are only subject to the 100-foot protected buffer (solid orange on the attached map) as the other buffers are engulfed by the wetlands. It may be beneficial to review the proposed buffer rules relative to wetlands to assure that water quality goals are satisfied.

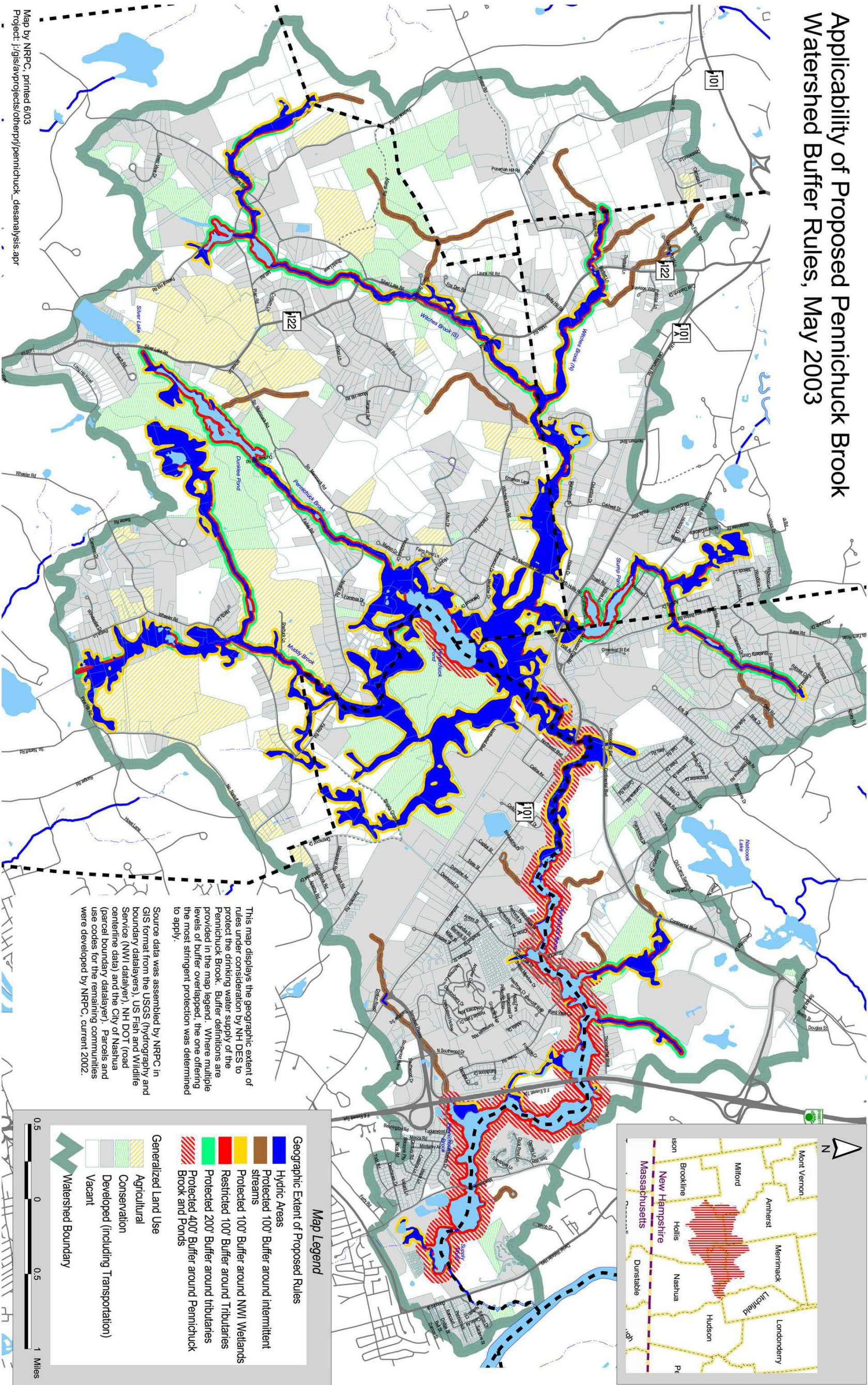


Table 2: Land Uses Impacted by the Proposed Buffer Rules

Municipality	Buffer Type	Generalized Land Use (acres)				Grand Total
		Agricultural	Conservation	Developed	Undeveloped	
Amherst	Intermittent	0	0	11	30	40
	Protected 100'	0	0	32	60	93
	Protected 200'	0	0	22	13	35
	Protected 400'	0	0	0	0	0
	Restricted	0	0	25	19	44
	Total	0	1	90	121	212
Hollis	Intermittent	5	14	16	28	64
	Protected 100'	47	63	124	119	353
	Protected 200'	15	40	39	30	125
	Protected 400'	0	1	0	0	2
	Restricted	15	54	51	35	156
	Total	83	173	231	212	699
Merrimack	Intermittent	0	2	12	23	38
	Protected 100'	0	22	36	35	94
	Protected 200'	0	4	27	12	43
	Protected 400'	0	7	60	112	179
	Restricted	0	8	42	59	109
	Total	0	43	178	241	463
Milford	Intermittent	0	0	0	36	36
	Protected 100'	0	0	0	2	2
	Protected 200'	0	0	0	2	2
	Protected 400'	0	0	0	0	0
	Restricted	0	0	0	1	1
	Total	0	0	0	41	41
Nashua	Intermittent	0	0	38	0	38
	Protected 100'	0	73	44	80	196
	Protected 200'	0	1	0	0	1
	Protected 400'	0	21	139	46	206
	Restricted	0	7	47	17	72
	Total	0	102	268	143	514
Watershed	Total	83	320	767	759	1,929

Source: NRPC GIS, 2003

Applicability of Proposed Pennichuck Brook Watershed Buffer Rules, May 2003



Map by NRPC, printed 6/03
Project: j:\gis\projects\other\pennichuck_desanalysis.apr